

**Remarks/Arguments:**

Claims 43-54 and 56-58 were now the pending claims in this application. Claim 59 is newly added. Accordingly, claims 43-54 and 56-59 are now the pending claims in this application.

Claims 43 and 44 are current amended. Support for the amendment to claim 43 may be found at, for example, page 4, lines 9-20 of the original application. Claim 44 is amended to correct a typographical error. No new matter has been added.

Claim 59 is new. Support for new claim 59 may be found at, for example, page 13, line 5 and page 7, lines 14-16 of the original application. No new matter has been added.

**Rejections under 35 U.S.C § 103**

Claims 43-47, 49, and 56-58 stand rejected under 35 U.S.C § 103 as unpatentable over U.S. Patent No. 6,314,722 (Matros et al.) as evidenced by Catalysis Letters article by Miller et al. Claim 48 stands rejected as unpatentable over Matros et al. in view of Miller et al. and WO 01/63104 (Roth et al.). Claims 50-54 stand rejected as unpatentable over Matros et al. in view of Miller et al. and JP 05-96132 (Murkai et al.). Claims 43-45, 47, and 49 stand rejected as unpatentable over JP 62-163731 (Obayashi et al.). Claims 43-47 and 49 stand rejected as unpatentable over EP 0582743 (Li et al.). Applicants respectfully traverse these rejections and submit that the currently pending claims are patentable at least for the reasons set forth below.

Claim 43, as currently amended, recites, in part:

adjusting the C1 hydrocarbon : nitrogen oxides (C1 HC:NO<sub>x</sub>) ratio of the exhaust gas to from 0.1 to 2;

contacting the gas mixture from the adjusting step with a catalyst consisting of a particulate acidic refractory oxide selected from the group consisting of zeolites, tungsten-doped titania, silica-titania, zirconia-titania, gamma-alumina, amorphous silica-alumina and mixtures of any two or more thereof,

wherein nitrogen dioxide (NO<sub>2</sub>) present in the gas mixture is converted to nitrogen monoxide (NO) . . . .

**Matros et al. and Miller et al.**

Claims 43-47, 49, and 56-58 stand rejected under 35 U.S.C § 103 as unpatentable over U.S. Patent No. 6,314,722 (Matros et al.) as evidenced by Catalysis Letters article by Miller et al. Applicants respectfully traverse these rejections because Matros et al., alone or in hypothetical combination with Miller et al., fails to disclose or suggest that nitrogen dioxide (NO<sub>2</sub>) present in the gas mixture is converted to nitrogen monoxide (NO).

Matros et al. is directed to a converter for purifying exhaust gases from lean-burn engines and controlling the amount of NO<sub>x</sub> and soot. As described in Matros et al. at column 5, lines 41-46:

Within the temperature window of the lean-NO<sub>x</sub> catalyst, the chemical reductant (taken as HC) either reduces the NO<sub>x</sub> or is oxidized by the oxygen. The chemistry of NO<sub>x</sub> reduction is represented by the following generalized process:



Additionally, when SCR (selective catalytic reduction) catalysts are used in the proper temperature window (e.g., about 250 to about 450-500 °C), the NO<sub>x</sub> components are also reduced to H<sub>2</sub>O and N<sub>2</sub>. See column 5, line 64 to column 6, line 5 and column 5, lines 8-10 of Matros et al. Thus, Matros et al. is concerned about the reduction of NO<sub>x</sub> to N<sub>2</sub>.

The Office Action alleges that "it must be assumed that NO<sub>2</sub> contained in the nitrogen oxide containing exhaust gas is reduced to NO." Office Action page 3. There is nothing in Matros et al. to suggest that NO<sub>x</sub> (e.g., NO and NO<sub>2</sub>) should remain as NO<sub>x</sub> (e.g., NO<sub>2</sub> → NO, as claimed).

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984). See M.P.E.P. § 2141.02(VI).

In fact, Matros et al. shows that, for example, oxidizing ammonia (the reductant for SCR) to N<sub>2</sub>, NO, or N<sub>2</sub>O is undesirable because the selectivity is decreased. As described in the

present application, the object of an HC-SCR is to convert all  $\text{NO}_x$  to  $\text{N}_2$ , but the claimed invention shows that although a relatively small amount of reduction to  $\text{N}_2$  is effected, very good conversion of nitrogen dioxide ( $\text{NO}_2$ ) to nitrogen monoxide (NO) can be achieved at much lower temperature and C1 HC: $\text{NO}_x$  ratios than for HC-SCR. See page 4, lines 9-20 of the original application, for example. Thus, Matros et al. fails to disclose or suggest that nitrogen dioxide ( $\text{NO}_2$ ) present in the gas mixture is converted to nitrogen monoxide (NO).

The Office Action relies upon Miller et al. for allegedly showing this point. Miller et al., however, further evidences that  $\text{NO}_x$  is converted to  $\text{N}_2$ . As described in Miller et al., the first step in the selective catalytic reduction of  $\text{NO}_x$  is the oxidation of NO to  $\text{NO}_2$ . Following the NO oxidation, by a complex series of reaction,  $\text{NO}_2$  is converted to  $\text{N}_2$ . Accordingly, Miller et al. further substantiates that the object of Matros et al. is to reduce  $\text{NO}_x$  to  $\text{N}_2$  and not maintain  $\text{NO}_x$  (e.g.,  $\text{NO}_2 \rightarrow \text{NO}$ , as claimed).

Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been established. Thus, claim 43 should be in condition for allowance. Claims 43-54 and 56-59 depend, directly or indirectly, from claim 43, and therefore should each be allowed as dependent thereon.

As an aside, it is noted that the Office Action mischaracterizes the disclose of Matros et al. as allegedly showing a tungsten doped titania at column 4, lines 64-65. Matros et al. discloses transition metals (for example Fe, Cu and Co) and ZSM-5 or zeolite-Y at column 4, lines 64-65. There is no mention of titania in this citation.

**Matros et al., Miller et al., and Roth et al.**

Claim 48 stands rejected as unpatentable over Matros et al. in view of Miller et al. and WO 01/63104 (Roth et al.). Claim 48 depends indirectly from claim 43 and should be deemed allowable as dependent thereon for at least the reasons set forth above.

**Matros et al., Miller et al., and Murkai et al.**

Claims 50-54 stand rejected as unpatentable over Matros et al. in view of Miller et al. and JP 05-96132 (Murkai et al.). Claims 50-54 depend, directly or indirectly, from claim 43 and should be deemed allowable as dependent thereon for at least the reasons set forth above.

**Obayashi et al.**

Claims 43-45, 47, and 49 stand rejected as unpatentable over JP 62-163731 (Obayashi et al.). Applicants respectfully traverse these rejections because Obayashi fails to disclose or suggest the catalyst, as claimed.

Claim 43 recites, in part, contacting the gas mixture from the adjusting step with a catalyst *consisting of* a particulate acidic refractory oxide selected from the group consisting of zeolites, tungsten-doped titania, silica-titania, zirconia-titania, gamma-alumina, amorphous silica-alumina and mixtures of any two or more thereof.

The transitional phrase "consisting of" excludes any element, step, or ingredient not specified in the claim except for impurities ordinarily associated therewith. See MPEP 2111.03 and *In re Gray*, 53 F.2d 520, 11 USPQ 255 (CCPA 1931); *Ex parte Davis*, 80 USPQ 448, 450 (Bd. App. 1948).

Obayashi is directed to  $TiO_2$ - $V_2O_5$  and  $TiO_2$ - $WO_3$ - $V_2O_5$  catalysts. See Examples 1 and 2 of Obayashi, respectively. Thus, the catalysts of Obayashi include an additional ingredient  $V_2O_5$ , which is not specified in the claim and is not an impurity ordinarily associated with titania or tungsten.

Because Obayashi fails to disclose a catalyst *consisting of* a particulate acidic refractory oxide selected from the group consisting of zeolites, tungsten-doped titania, silica-titania, zirconia-titania, gamma-alumina, amorphous silica-alumina and mixtures of any two or more thereof, Applicants respectfully submit that a *prima facie* case of obviousness has not been established. Thus, claim 43 should be in condition for allowance. Claims 43-54 and 56-59 depend, directly or indirectly, from claim 43, and therefore should each be allowed as dependent thereon.

**Li et al.**

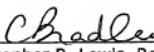
Claims 43-47 and 49 stand rejected as unpatentable over EP 0582743 (Li et al.). Applicants respectfully traverse these rejections because Li et al., like Matros et al., fails to disclose or suggest that nitrogen dioxide ( $NO_2$ ) present in the gas mixture is converted to nitrogen monoxide (NO).

Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been established. Thus, claim 43 should be in condition for allowance. Claims 43-54 and 56-59 depend, directly or indirectly, from claim 43, and therefore should each be allowed as dependent thereon.

**Conclusion**

In view of the amendments and arguments set forth above, Applicants respectfully submit that the pending application is in condition for allowance. Notice to this effect is earnestly solicited.

Respectfully submitted,

  
\_\_\_\_\_  
Christopher R. Lewis, Reg. No. 36,201  
Christine E. Bradley, Reg. No. 65,752  
Attorneys for Applicants

CRL/CEB/lrb

Dated: July 5, 2011

P.O. Box 980  
Valley Forge, PA 19482-0980  
(610) 407-0700

The Director is hereby authorized to charge or credit Deposit Account No. 18-0350 for any additional fees, or any underpayment or credit for overpayment in connection herewith.

1042580\_1